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AUTHORITY

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AUTHORS: (8) Polyvyannyy, I. R., Avrov, V. G.

TITLE: (6) Investigating kinetics of thermochemical dissociation of sodium sulfate in the presence of vanadium pentoxide

SOURCE: (15) Akademiya nauk Kazakhskoy SSR. Institut metallurgii i obogashcheniya. Trudy. v. 5, 1962, Tsvetnaya metallurgiya. 41 - 48

TEXT: The investigation was made for the purpose of revealing the basic kinetic regularities in the thermochemical dissociation, depending on temperature, sintering duration and the amount of vanadium pentoxide. The sodium sulfate and vanadium pentoxide mixture was placed in a preheated tubular electric furnace to determine the SO_3 amount which, after Na_2SO_4 dissociation, is supplied to an absorption column. Qualitative experiments were performed to estimate the dissociation rate; the batch was placed into a cold furnace which was then heated to the required temperature (20 to 1,250°C). The experiments show that the beginning of the thermochemical dissociation of Na_2SO_4 in the presence of V_2O_5 depends upon the amount of V_2O_5. Pure sodium sulfate begins to dissociate at 900°C; if V_2O_5 is added in a ratio of 10 : 1, dissociation begins at 600°C; at a stoichiometric ratio $\frac{Na_2SO_4}{V_2O_5} = \frac{1}{1}$, the temperature of visible dissociation drops to 500°C. The rate and degree of dissociation increase sharply with higher temperatures and extended sintering time, namely from 2.84% at 600°C and 60 minutes sintering time (at a 1 : 1 molar ratio of the substances) to 93.5% at 1,000°C. Variations in the dissociation with time are graphically expressed by parabolic curves. A decrease in the V_2O_5 amount in the mixture reduces the rate and degree of sodium sulfate dissociation from 93.5 to 16.85% at a 1 : 1 and 10 : 1 ratio, respectively, and 60 minutes sintering time. An analysis of the results of phase transformations leads to the conclusion that a higher dissociation rate of Na_2SO_4 in the presence of V_2O_5, in particular at 850°C and more, is due to the formation of sodium vanadate from the dissociation product of sodium sulfate and vanadium pentoxide; the formation of a liquid phase, promoting the rate of mass transfer, and to the catalytic effect of V_2O_5 on the reaction of sodium sulfate dissociation. The process is described by the

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following summary reactions:

$$Na_2SO_4 \rightleftarrows Na_2O + SO_{3gas}$$

$$SO_{3gas} \rightleftarrows SO_{2gas} + 1/2\,O_{2gas}$$

$$nNa_2O + mV_2O_5 = nNa_2O\,mV_2O_5$$

There are 4 figures and 1 table.